



CO₂ Capture Large-scale Pilot Test Using Aminosilicone Solvent

FE0026498 GE Kick-off Meeting
November 2, 2015

Imagination at work.

Acknowledgment:

This material is based upon work supported by the Department of Energy under Award Number DE-FE0026498.

Disclaimer:

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.



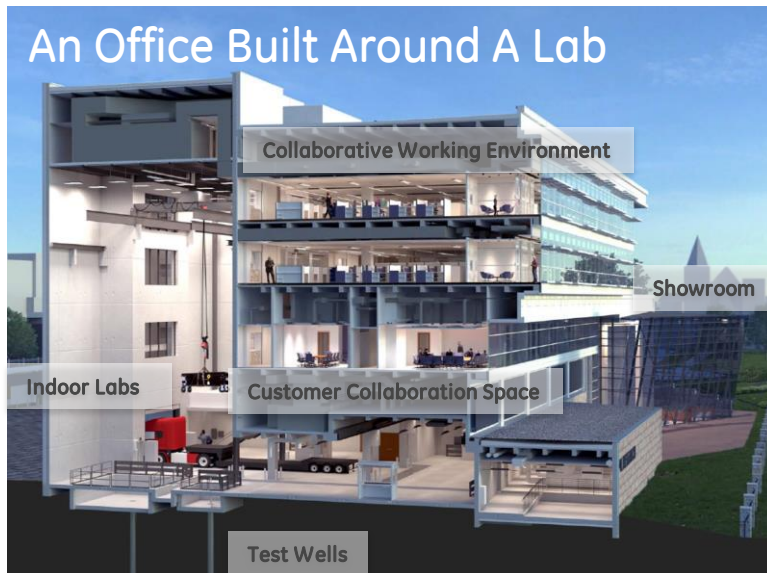
Presentation Outline

- Project Background
- Project Objectives
- Project Team
- Project Structure
- Project Schedule
- Project Management Plan
- Deliverables
- Current Project Status
- Questions & Closing Comments



Project Background

Oil & Gas Technology Center



The newly established OGTC, located in Oklahoma City, Oklahoma, is GE's first industry-specific global research site.

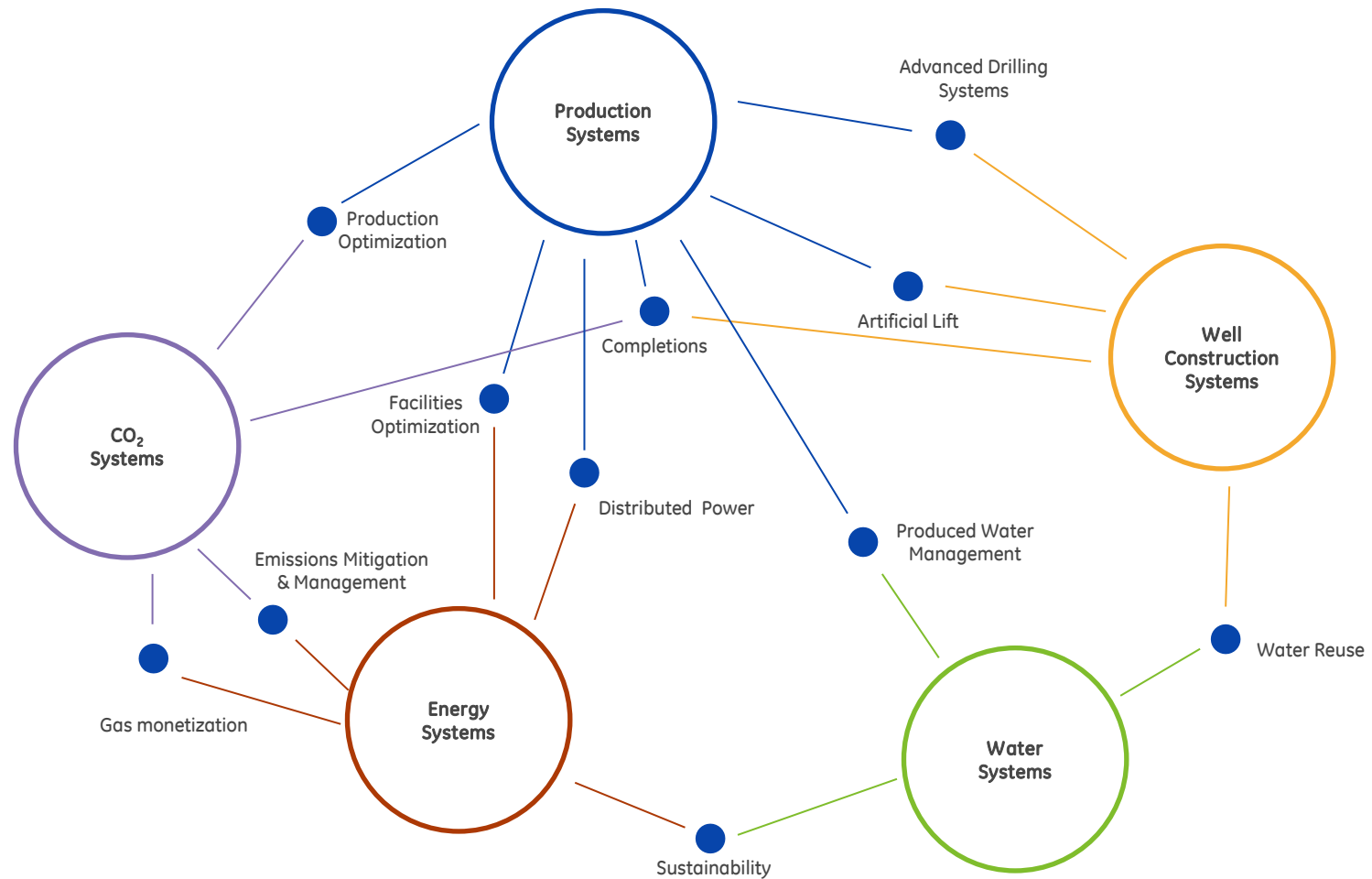
The OGTC seeks to develop solutions and new products for GE customers by advancing early TRL technologies and applying GE technologies from other GE business areas.

The mission of the CO₂ capture and separation team is to develop CO₂ supply solutions for GE customers in the Oil and Gas Sector.



Strategic Research Interdependencies

Strategic themes emerging from cross-program priorities



Project Background

Global Research Center - Niskayuna



GE Global Research, located in Niskayuna, New York, (Figure 20) is one of the world's largest and most diversified industrial research laboratories and has more than 100 years of history in science and technology. It is the cornerstone of GE's commitment to technology leadership and serves all of GE's businesses.

GRC has facilities and competency to conduct laboratory experiments, chemical analyses, bench scale pilot tests, and ASPEN process simulations.

The center has the ability to design, fabricate and assemble process equipment.



CO2 Capture Test Facility at Mongstad



Support from Berit
Fostas, Bjorn-Erik
Haugan, Hans Jorgen
Vinje, Laila Helgesen and
others

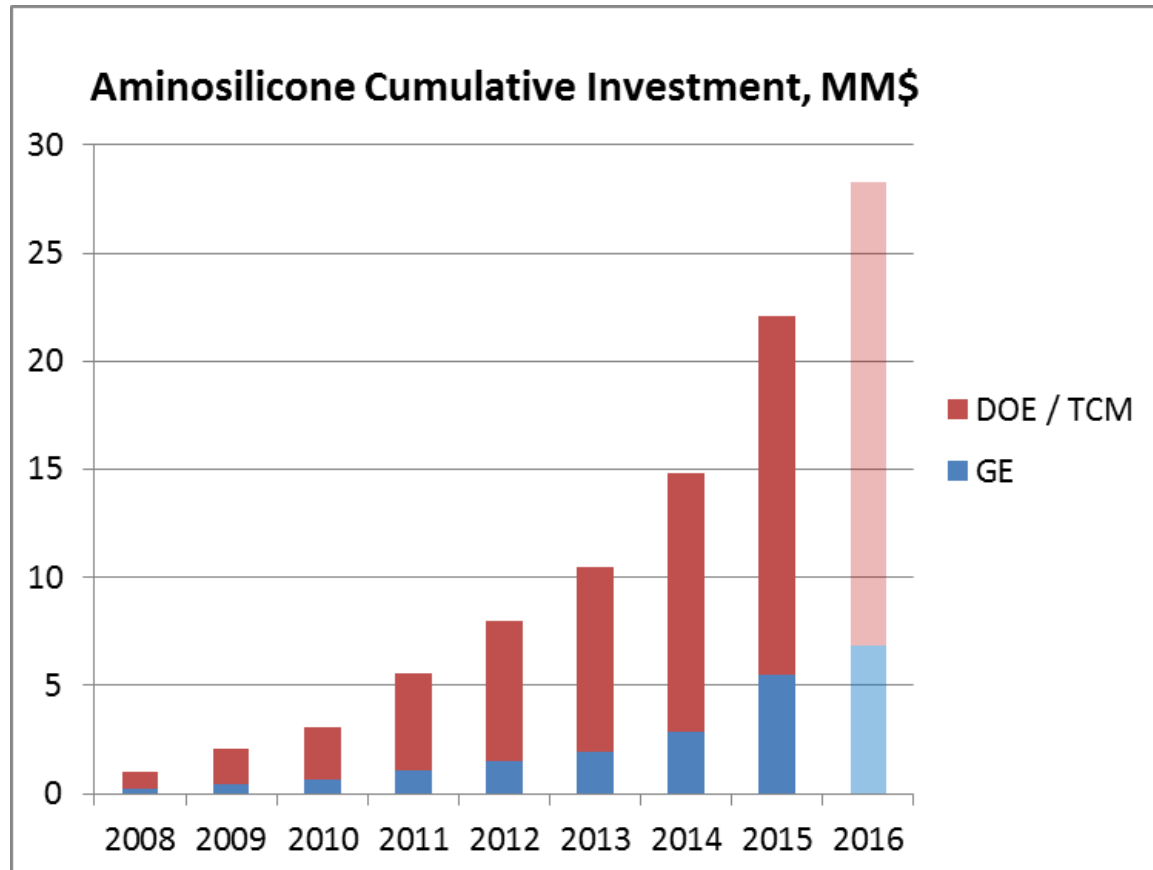
Facility Expertise

CO2 capture expertise

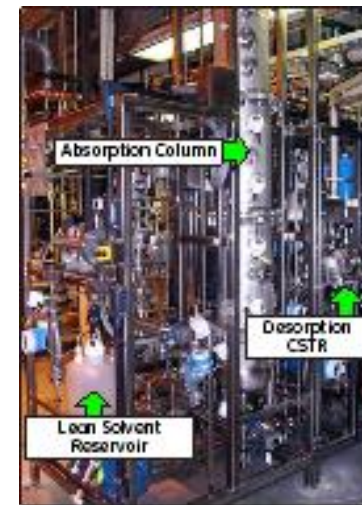
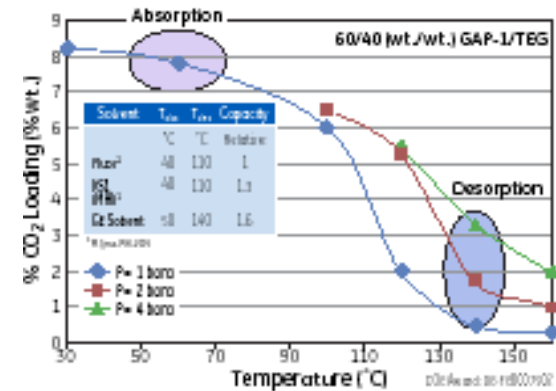
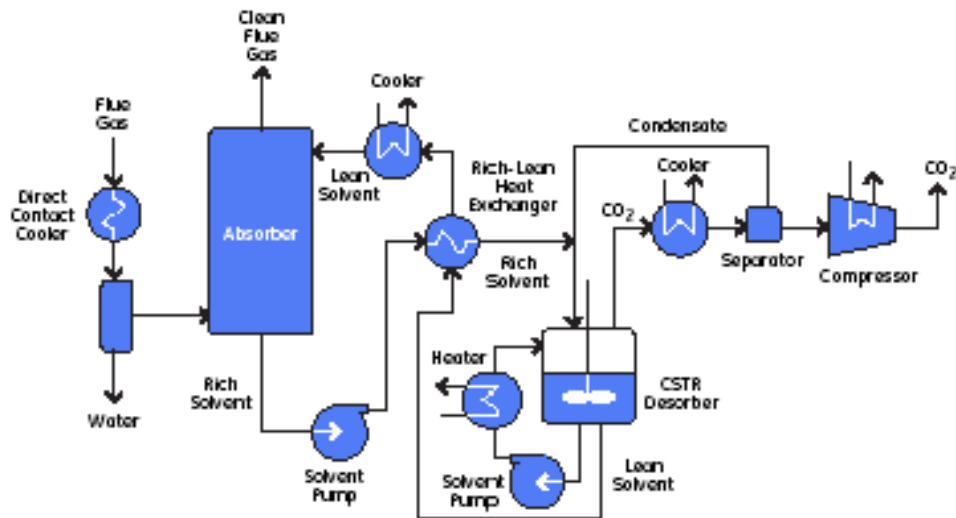
Process Evaluation,
benchmarking



Research Leading To This Award



Research Leading to This Award



Project Objectives

The overall objective is to demonstrate aminosilicone as a viable commercial process capable of 90% CO₂ capture, 95% CO₂ purity, and a CO₂ capture cost of \$40/tonne.

The objective of phase 2 is to demonstrate two months of continuous operation and sustained performance at 10 MW scale (## kgCO₂ captured per hour) at the CO₂ Capture Test Facility in Monstad, Norway.

Secondary objectives are to demonstrate low solvent loss rate and diversity of solvent supply

The objective of phase 1 is to plan the phase 2 project and develop a renewal application. The renewal application will include a

- Site evaluation

- Technology gap analysis

- Techno-economic analysis

- Environmental, health and safety report

- Cost estimate and schedule for the phase 2 project



Project Team

Phil Di Pietro



- Principal Investigator
- CO2 Capture and Separation Technical Manager at GE's Oil and Gas Technology Center
- B.S. Chemical engineering

Charles Womble



- Site Assessment and Technology Gap Analysis
- EOR and natural gas operations, 25 years experience
- Designing and managing CO2 separation (solvent and membrane) technologies, recompression and reinjection facilities

Robert J. Perry, PhD



- Solvent Supply and EHS
- Synthetic Organic Chemist with 20+ year experience
- Project Leader for DOE NT-0005310, DE-AR0000084

Jamison Shaffer



- TEA, Cash flow model
- Financial, economic, and commercial analyst with 10 years Oil & Gas experience

Surinder Singh, Ph.D



- Process modeling, system optimization
- Led systems modeling development for Hollow Fiber CO2 Membrane (DE-FE0007514)



Project Team

Team Advisors & Performance Of Supporting Efforts

Benjamin R. Wood, Ph.D.



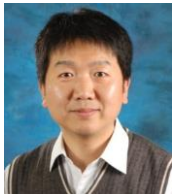
- Process Design Engineer with 10+ year Experience
- PI for DE-FE0013755 (GAP-1/TEG bench) and DE-FE0007502 (GAP-1/TEG pilot)

Sarah Genovese



- Material Development Engineer for GAP-1/TEG
- Process Engineer for designing the lab, bench & pilot-scale CO₂ process

Wei Chen, Ph.D.



- Chemical Process Engineer with 15+ year Experience
- Program Management, Process Development, Modeling, Design & Scale Up

Dan Hancu, Ph.D.



- Organic Chemical Process Engineer with 15+ year Experience
- 10+ years project leadership in chemical material systems development

Joseph R. Moate, Ph.D.



- Low Power CO₂ removal process development
- Development of numerical models describing multi-phase absorption equilibria



Project Structure

Budget Period 1

- September 2015 through September 2016 totaling \$1,213,880

Project Management Task

- Coordinate Multidisciplinary Project Execution

Host Site Evaluation & Test Planning Task

- Evaluate Existing Equipment And Develop Process Concept

Basic Design of Pilot-Scale System Task

- Complete Preliminary Design Of Retrofit And Conduct TEA & TGA

Technology EH&S Assessment Task

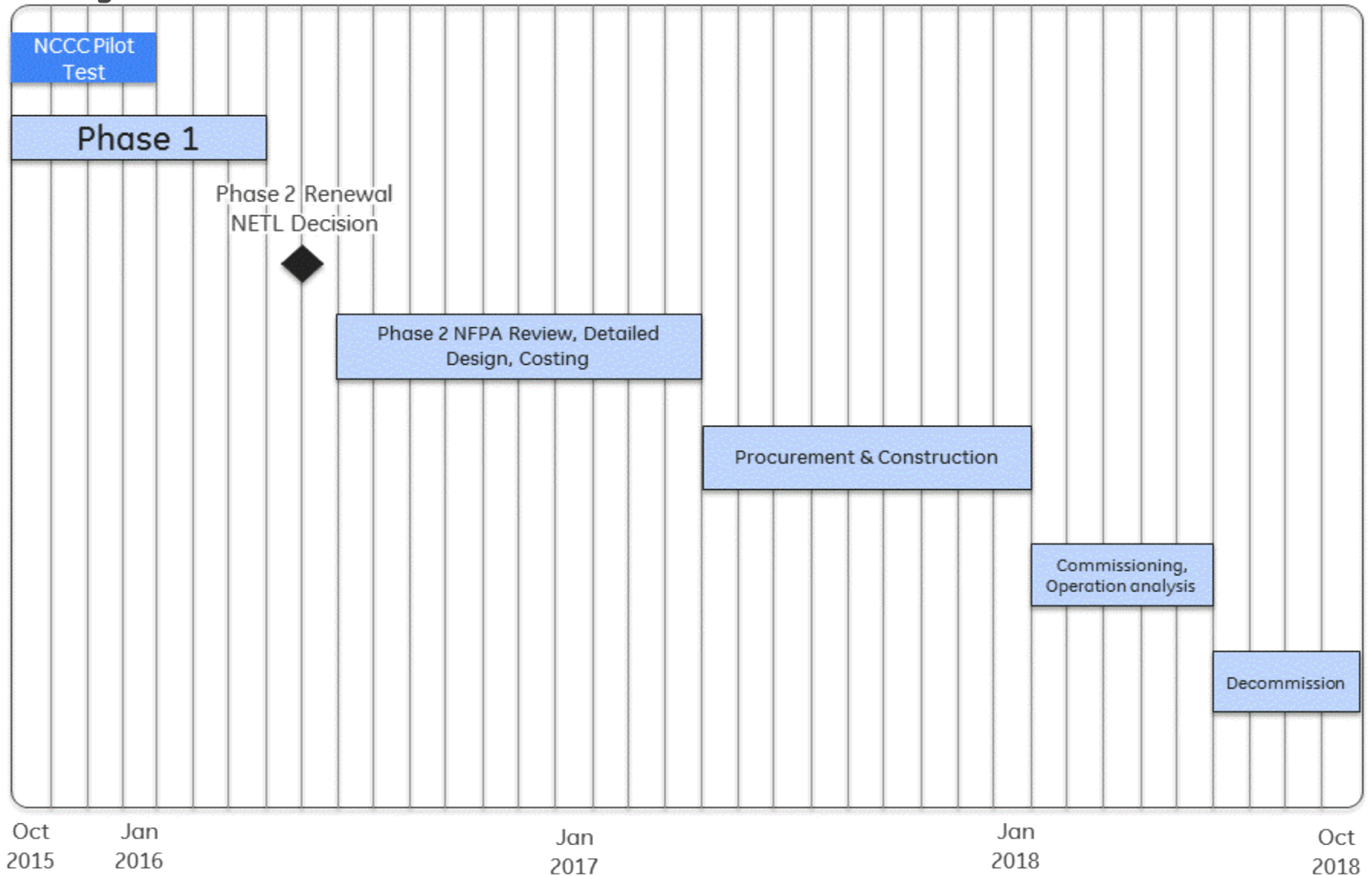
- Perform Technology EH&S Study

Solvent Manufacturability & Scale-up Task

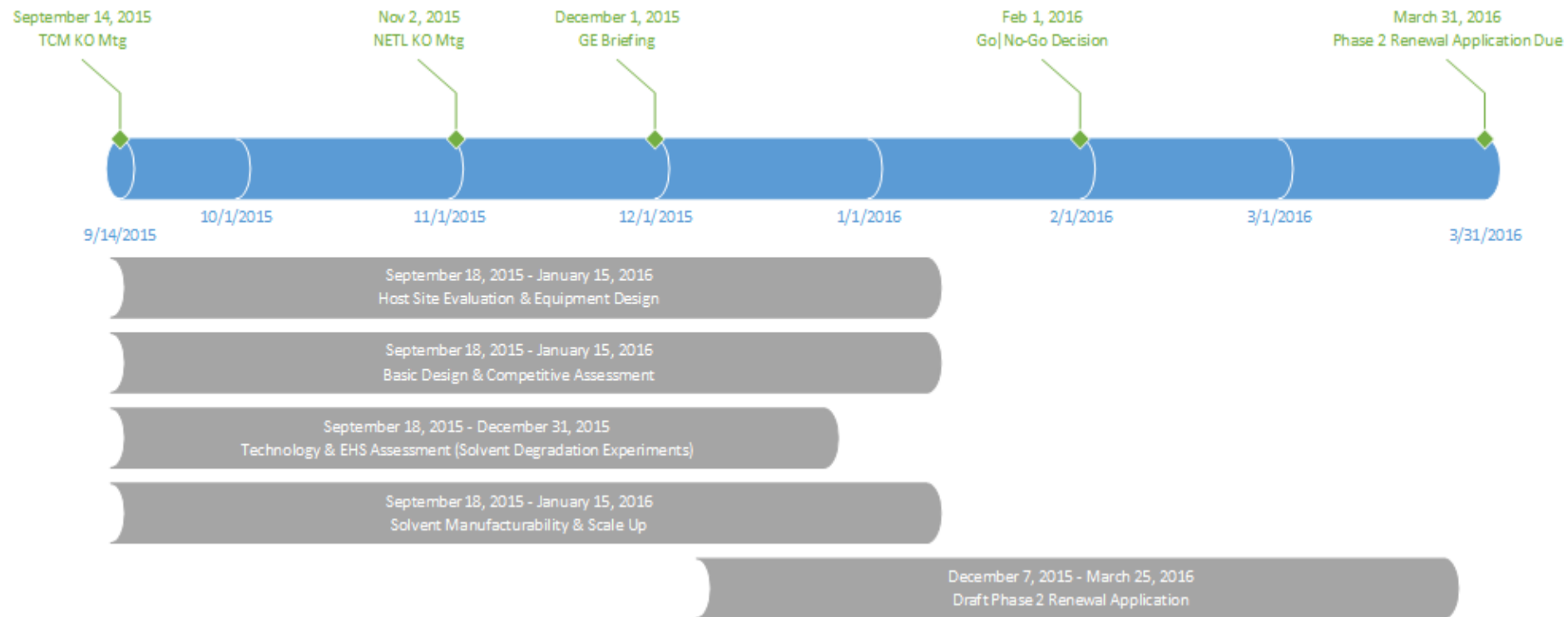
- Conduct Solvent Degradation Study



Project Schedule – Overall



Project Schedule – Phase 1



Project Management Plan

Milestones

Budget Period	ID	Task #	Description	Planned Completion Date	Actual Completion Date	Verification Method
1	A	1	Kick off meeting	12/31/2015		Presentation File
1	B	1	Presentation of technical papers at the DOE/NETL annual contractor's review meeting.	6/30/2016		
1	C	1	Renewal application	3/31/2016		
1	D	1	Updated project management plan	3/31/2016		PMP File
1	E	1	Go/no Go Decision for phase 2 pilot demonstration: host site meets evaluation criteria, solvent suppliers express interest at price w/in phase 2 budget, solvent reclamation solution identified, NCC pilot test shows sustained operation	3/31/2016		
1	A	2	Preliminary process model for host-sites	12/31/2015		
1	B	2	Determination of host site	12/31/2015		
1	C	2	Operation cost of phase 2 pilot demo	3/31/2016		
1	A	3	Basic design of pilot-scale system	3/31/2016		
1	B	3	RFQ for phase 2	6/30/2016		



Deliverables

Description	Due Date
Phase 1 Technology Engineering Design & Economic Analysis	3/31/2016
Phase 1 Technology Gap Analysis	3/31/2016
Process Model Files for Phase 1 System Analysis	3/31/2016
Phase 1 Environmental Health & Safety Study	3/31/2016
Phase 1 Topical Report	3/31/2016
Updated Project Management Plan	3/31/2016
Phase 2 Environmental Questionnaire	3/31/2016
Executed Financial Agreements	6/30/2016
Executed Host Site Agreements	6/30/2016
Updated Representations & Certifications	6/30/2016



Current Project Status

- GE visited the Mongstad facility on September 14 and gathered data to perform the site assessment (Phil DiPietro, Maggie Lelak, Dan Hancu, Morten Wiencke, Chad Yates)
- GE is performing lab scale tests of a change in the desorption process that will suppress solvent degradation.
- GE is assessing what data can be acquired from the NCCC test,
- GE has developed an ASPEN process simulation of the aminosilicone GAPm applied to the Mongstad facility.
- GE has conducted a preliminary assessment of the process equipment at Mongstad and each piece of equipment's amenability to the aminosilicone solvent
- GE has engaged a supplier of the aminosilicone chemical and begun the qualification process
- GE has engaged a laboratory facility to conduct degradation experiments of the aminosilicone solvent and test for degradation products
- GE has developed a preliminary cash flow model of the aminosilicone process at commercial scale



Questions



Closing Comments



